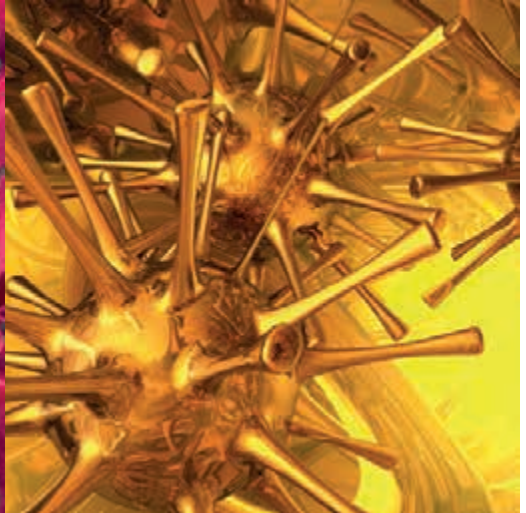
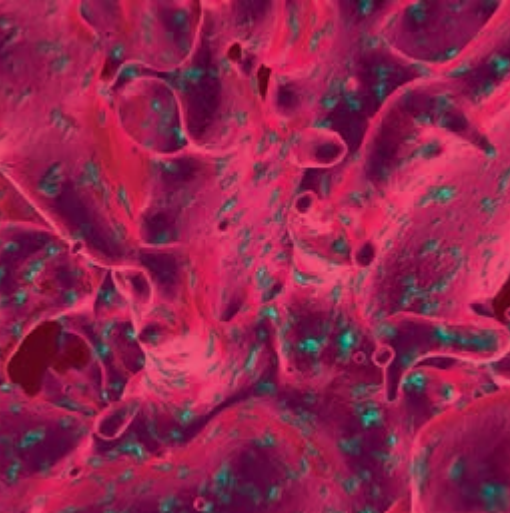
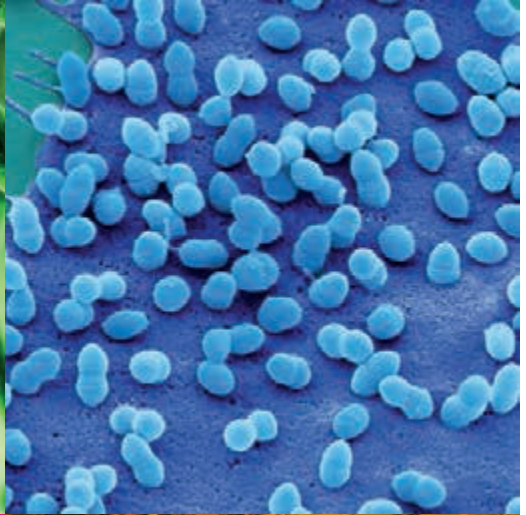


# CSSB

Centre for Structural  
Systems Biology





# CSSB – Centre for Structural Systems Biology

## **Where collaboration fuels innovation.**

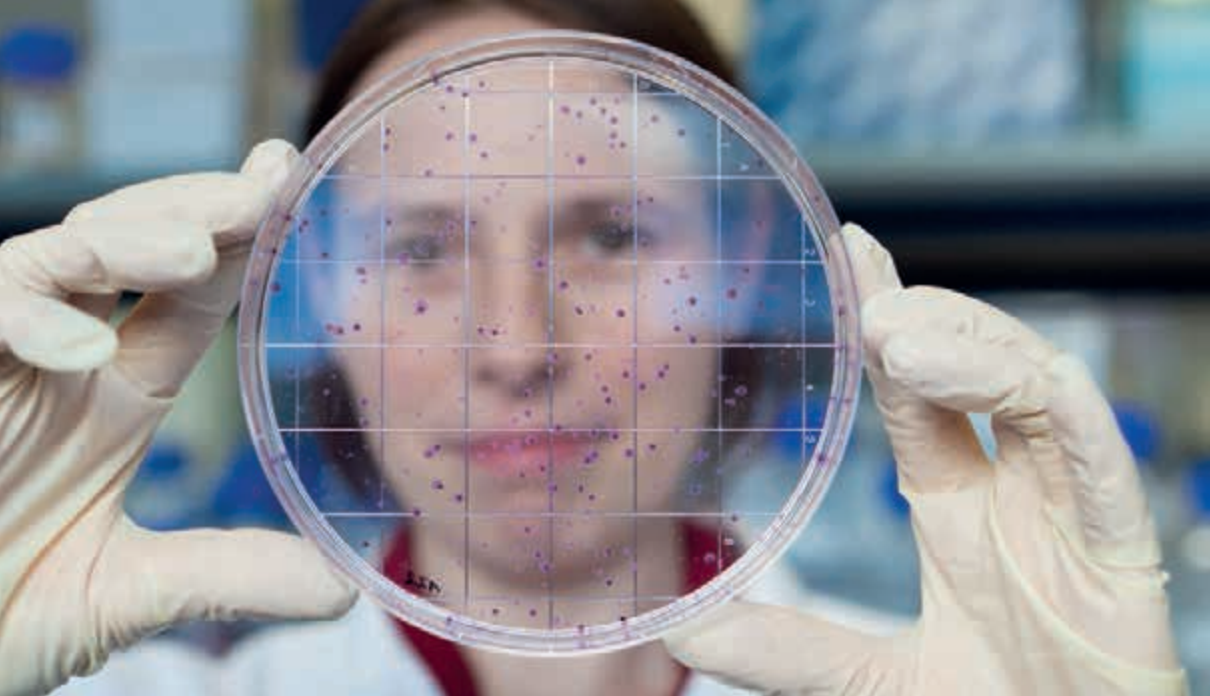
Infectious diseases are a global threat and many have no available treatments. In addition, certain pathogens are becoming increasingly resistant to existing treatment options. Using collaborative and interdisciplinary approaches, CSSB aims to generate research innovations that will shed light on the molecular mechanisms of the infection process. CSSB's privileged access to research facilities on the DESY campus combined with its advanced in-house technology will enable cutting-edge advances and discoveries in the fields of infection, structural and systems biology.





*“Uniting the strengths and expertise  
of our partner institutions with the  
facilities available at DESY ,  
CSSB will make pioneering contributions  
to our understanding  
of infectious diseases.”*

Matthias Wilmanns,  
European Molecular Biology Laboratory,  
CSSB Scientific Director



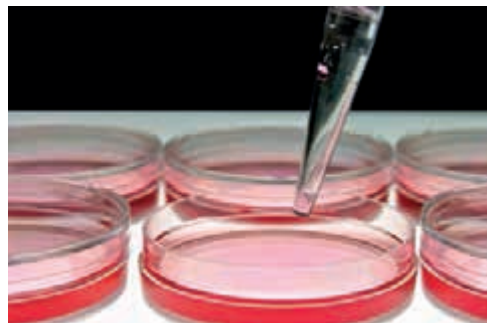
# Understanding Infection

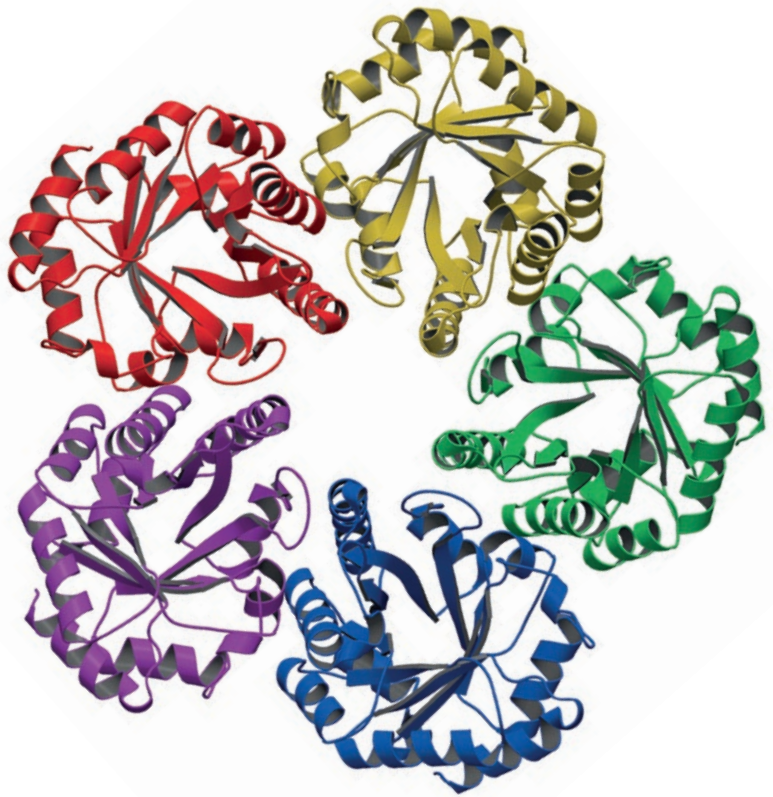
CSSB is at the forefront of infection, structural and systems biology research. By combining the best minds and most advanced technologies in these three scientific fields, CSSB seeks to improve our understanding of the infection process.

**Infection Biology** furthers the development of new strategies for the diagnosis, prevention and treatment of infectious diseases.

**Structural Biology** explores the underlying molecular structure and function of proteins in healthy or infected cells and in pathogens.

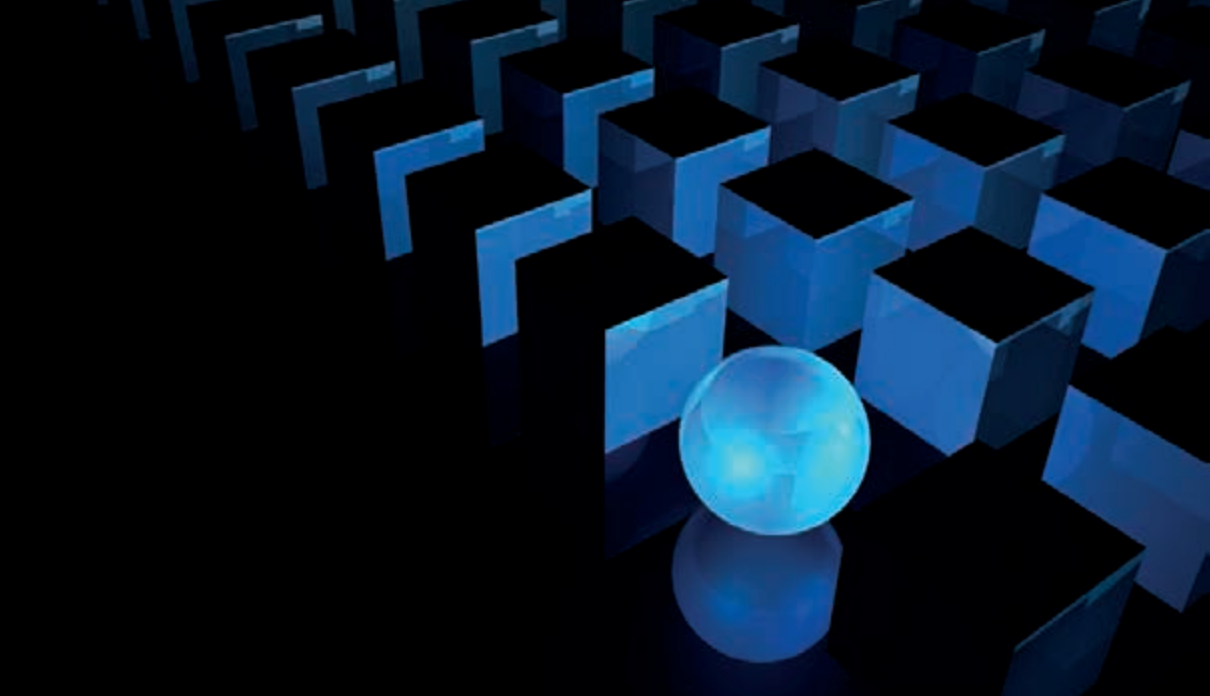
**Systems Biology** uses computational modeling approaches in combination with experimental setups to develop a comprehensive understanding of biological systems.





*“Integrating infection, structure and systems biology at CSSB will allow us to discover and understand unique biological concepts.”*

Michael Kolbe, CSSB,  
Helmholtz Centre for  
Infection Research

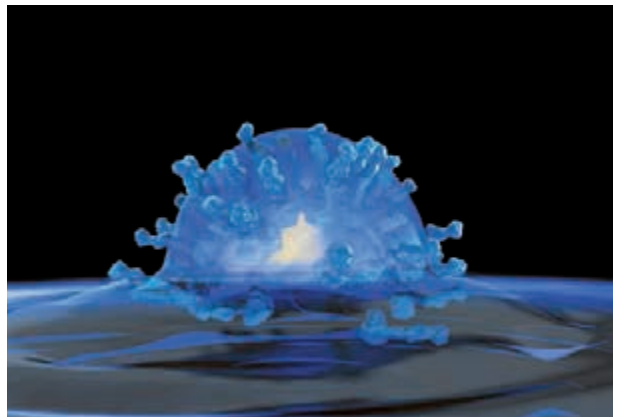


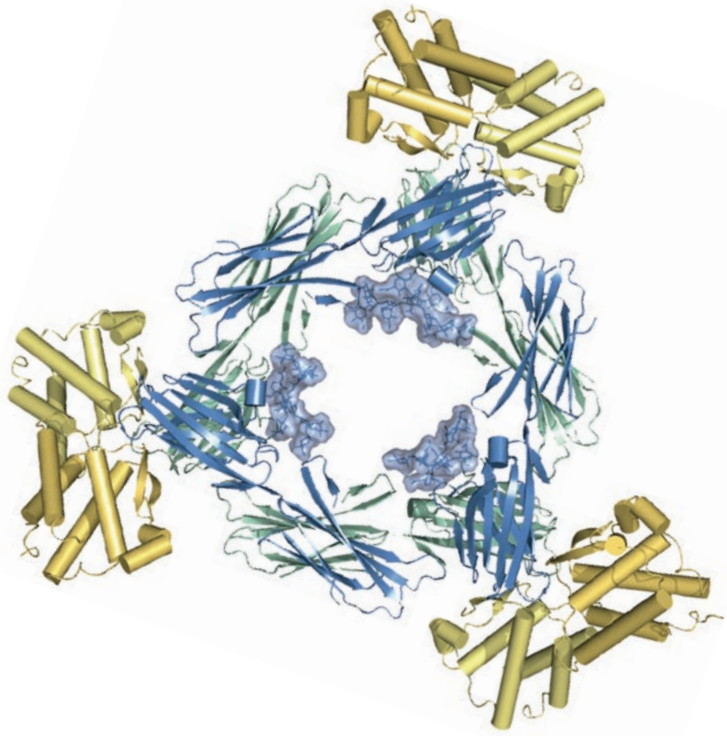
# Innovative & Interdisciplinary

**Innovative:** CSSB scientists take bold actions and use creative and cutting edge approaches.

**Collaborative:** CSSB scientists share their knowledge and work together to develop the best research methods.

**Interdisciplinary:** CSSB research extends beyond disciplines by combining the latest technologies and methodologies in the fields of infection, structural and systems biology.





*“Groundbreaking advances occur when scientists are given the freedom to innovate and the encouragement to collaborate. CSSB is truly setting the stage for greatness.”*

Jörg Labahn, CSSB,  
Forschungszentrum Jülich



## Stopping Invasion

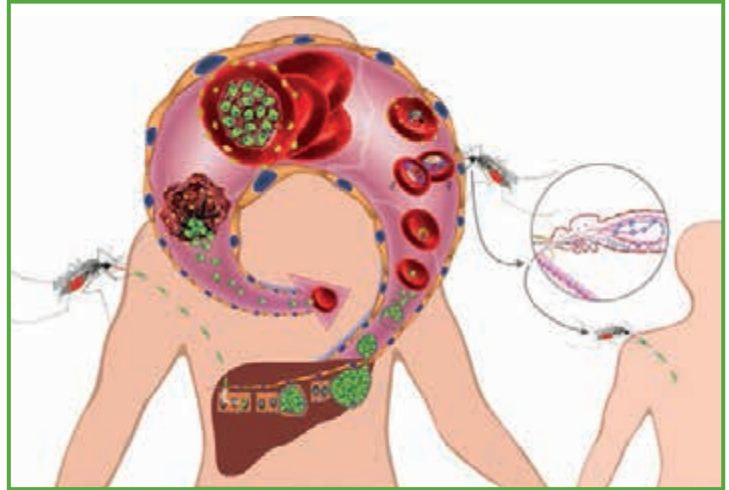
**Every 60 seconds a child dies of Malaria.**

Although it has been known for over 100 years that this deadly pathogen uses human red blood cells to multiply, the underlying molecular machinery that makes this possible is still not entirely understood.

By figuring out which of the parasite's 5200 proteins are directly involved in the invasion and transformation of red blood cells, CSSB scientists hope to identify and interfere with the weak spots of this pathogen.

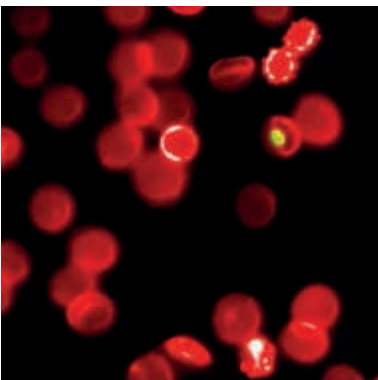


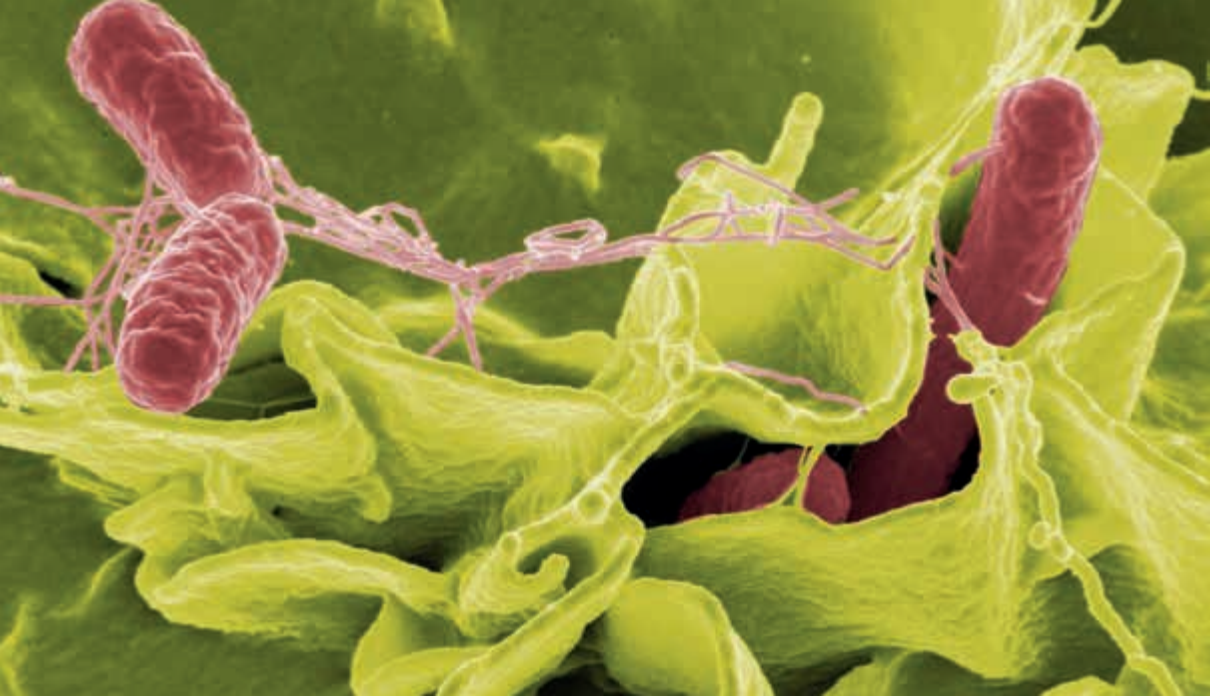




*“Hundreds of proteins are involved in host cell invasion and transformation. Identification of the ring leaders in these functional networks will help to define novel antimalarial targets.”*

Tim Gilberger, CSSB,  
University of Hamburg,  
Bernhard Nocht Institute  
for Tropical Medicine

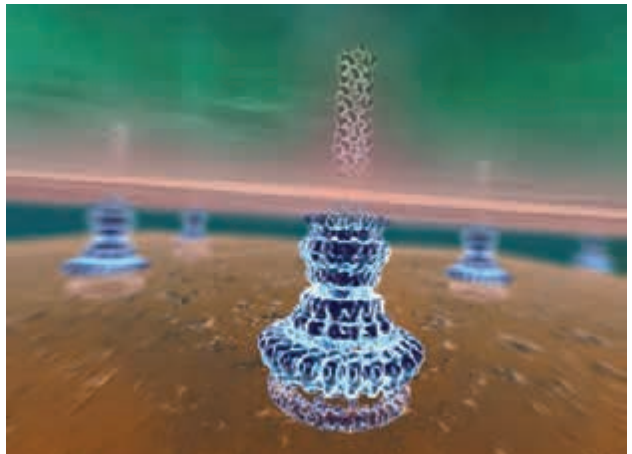


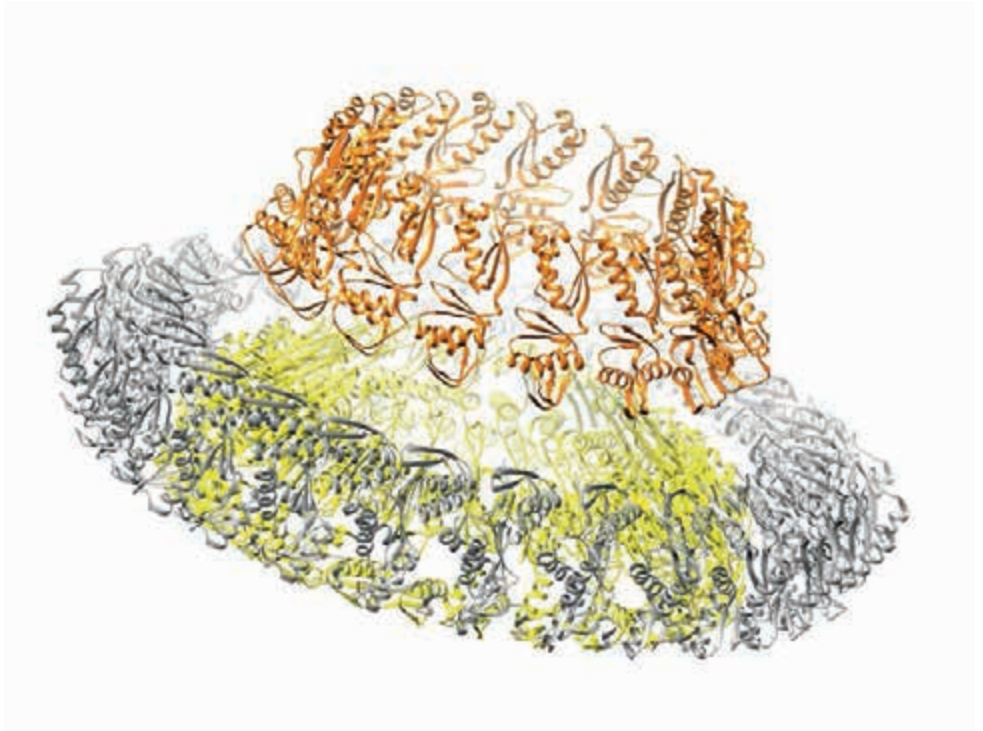


## Molecular Machines in Action

**Salmonella** is a rod shaped bacteria that causes both food poisoning and typhoid fever. After entering the human host, the Salmonella bacteria produce molecular injection needles on their surface which trigger the transfer of bacterial toxins and initiate the infection process.

CSSB scientists are examining the molecular machinery involved in this secretion system.





*“The needle complex is essential for microbial infection; however, its structure and mechanisms are poorly understood. Using the advanced technologies here at CSSB we are investigating exactly how this molecular machinery works.”*

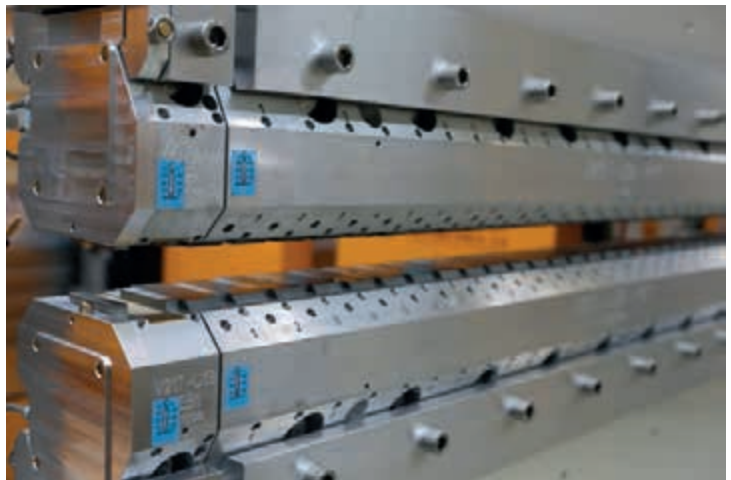
Thomas Marlovits, CSSB,  
University Medical Center  
Hamburg-Eppendorf



# Cutting Edge Technologies

Imaging technologies enable scientists to build accurate models of individual molecules and study their interactions with other biological molecules.

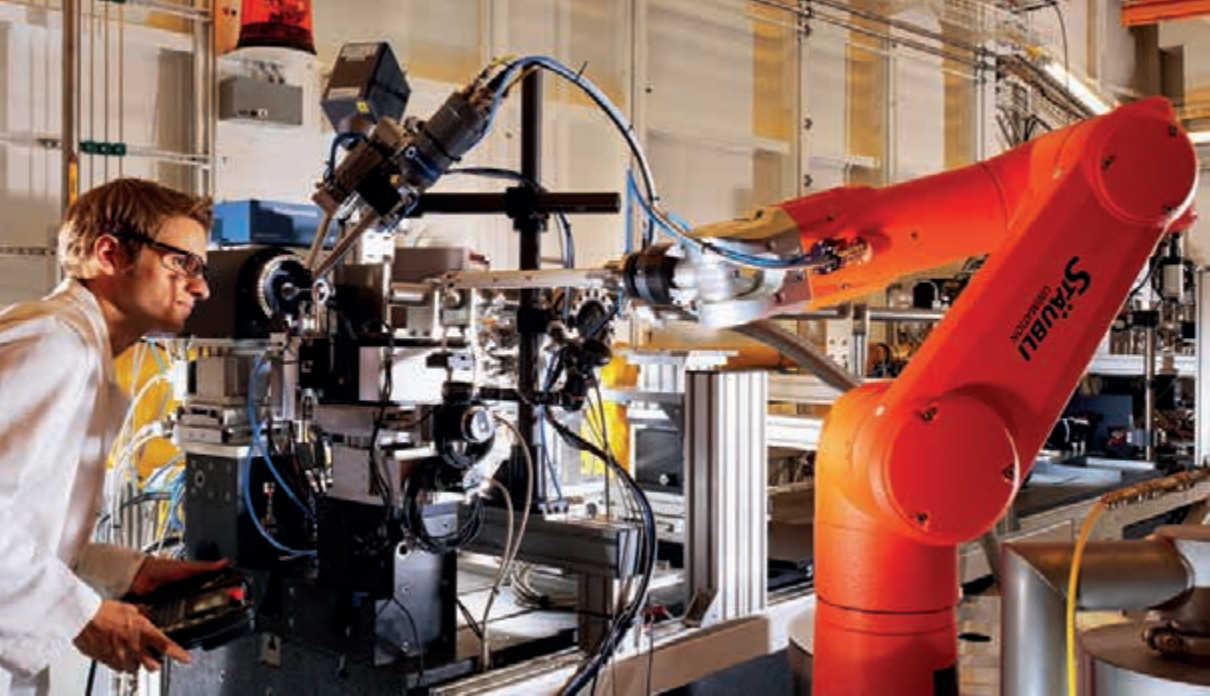
Combining the world-leading, high brilliant X-ray light sources available at DESY with CSSB's in-house, advanced microscopic imaging will allow CSSB scientists to generate images across an entire spectrum of resolution levels and organism complexity.





*“CSSB will bring in and apply such a wide spectrum of cutting edge technologies and methods allowing scientists to study infection over a range of different scales – zooming into locate single atoms within a molecule, and likewise panning out to observe the dynamics of host-pathogen interactions happening in real time – creating a complete picture of the infection process.”*

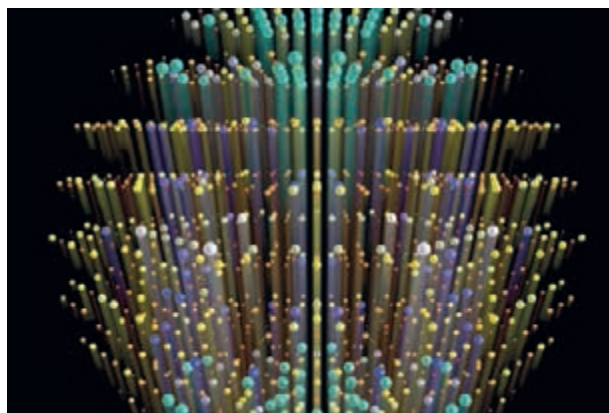
Kay Gruenewald, CSSB,  
University of Oxford,  
University of Hamburg,  
Heinrich Pette Institute

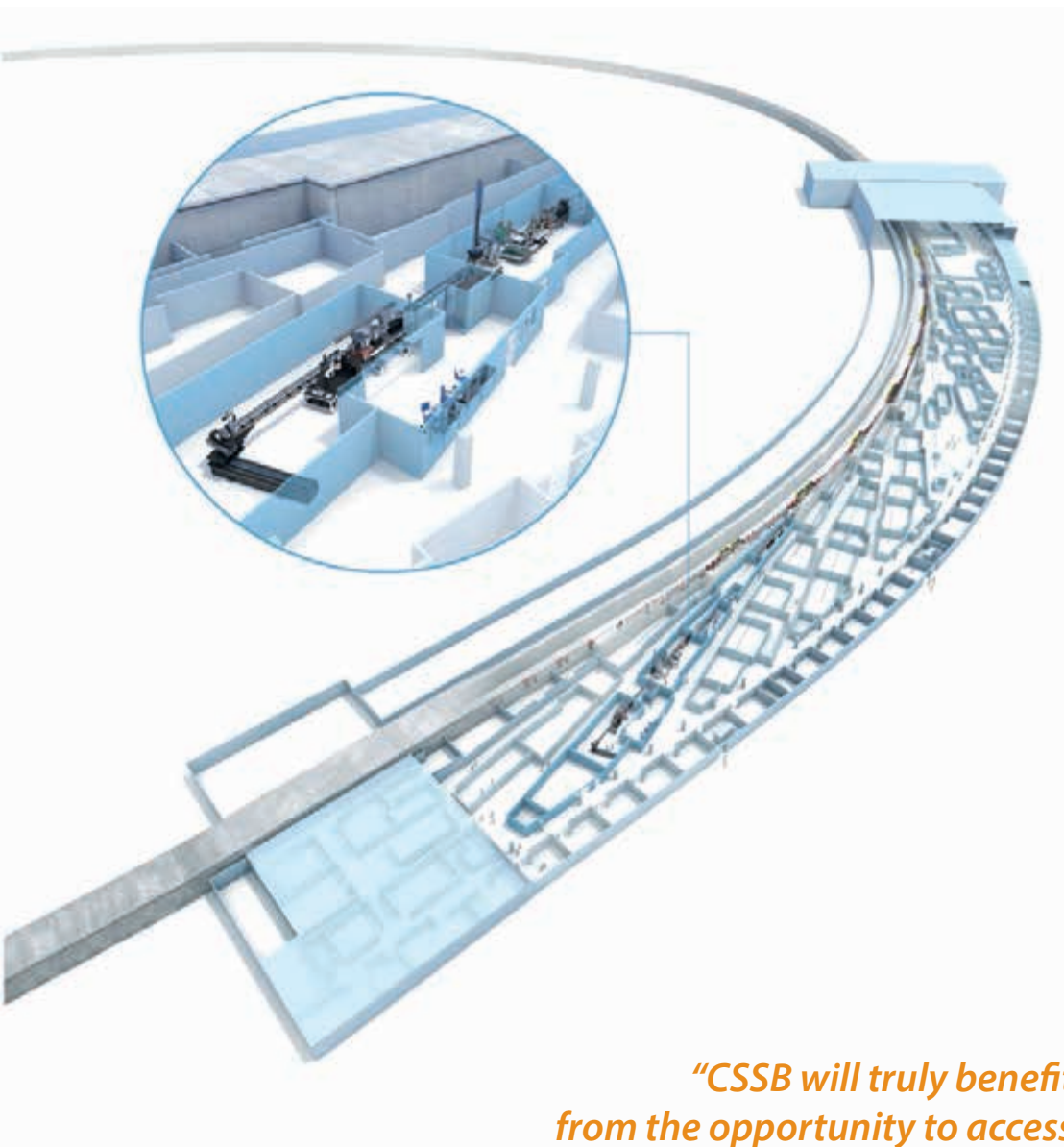


**PETRA III** is a dedicated high-brilliance synchrotron radiation source, which CSSB scientists will use to create detailed images of proteins and their interactions with other molecules.

**European XFEL** is a free-electron laser currently under construction that will allow CSSB scientists to gain insight into very large structures of biological complexes.

In-house, advanced imaging technologies, particularly cryo-electron microscopy and tomography and super-resolution fluorescence microscopy will enable CSSB scientists to reveal atomically accurate images of molecules in their native state.





*“CSSB will truly benefit from the opportunity to access the advanced imaging technologies available on the DESY campus.”*

Dietmar Manstein,  
Hannover Medical School,  
CSSB Directorate

# CSSB Partners



Deutsches Elektronen-Synchrotron  
A Research Centre of the Helmholtz Association



European Molecular Biology Laboratory



Heinrich Pette Institute  
*Leibniz Institute for Experimental Virology*



Medizinische Hochschule  
Hannover



Universitätsklinikum  
Hamburg-Eppendorf



Universität Hamburg  
DER FORSCHUNG | DER LEHRE | DER BILDUNG



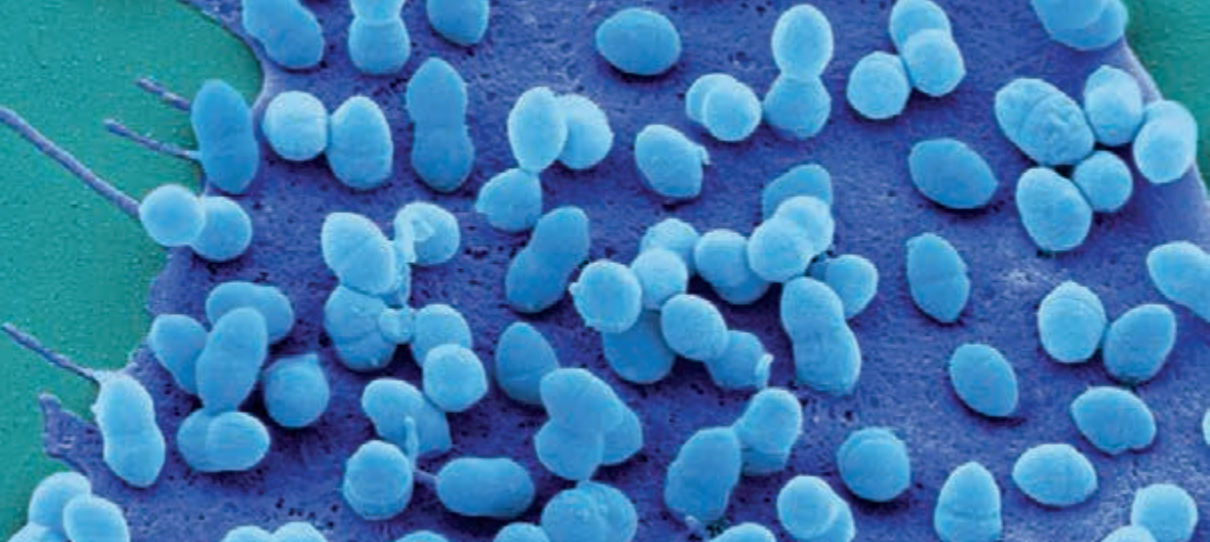


# CSSB

## Centre for Structural Systems Biology

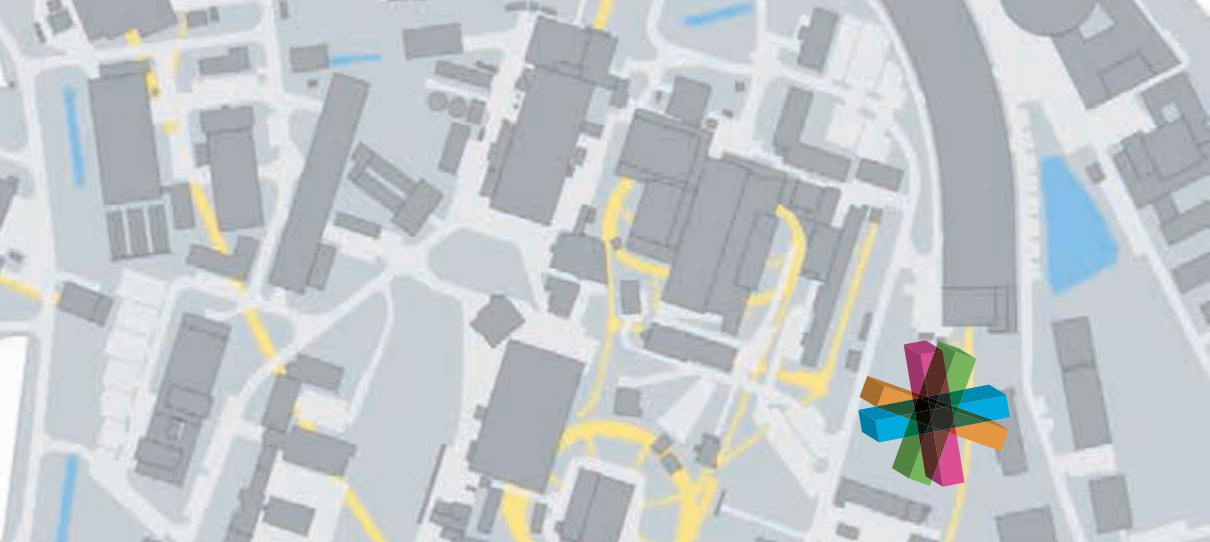
*“The interdisciplinary cooperation of CSSB’s nine partners has turned an inspirational idea into a reality. The combined strengths and expertise these partners will enable CSSB scientists to generate revolutionary insights into the mechanisms of the infection process. This will pave the way to more effective treatment options.”*

Edgar Weckert,  
Deutsches Elektronen-Synchrotron DESY,  
CSSB Directorate



*“CSSB’s innovative research focus combined with its interdisciplinary and collaborative research approach will take infection biology an important step further. CSSB will become a beacon for research.”*

Chris Meier,  
University of Hamburg,  
CSSB Deputy Director

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CSSB is a cooperation without its own legal identity. All partners act exclusively in their own name and on their own account.





# CSSB Quick Facts

- CSSB is at the forefront of infection, structural and systems biology research.
- CSSB is a cooperation of nine research partners from Northern Germany, including three universities and six research institutes.
- In 2004, the initiative to create the CSSB started and in 2012 CSSB partners signed a cooperation agreement.
- The CSSB building, located on the DESY Campus in Hamburg has:
  - more than 2881 m<sup>2</sup> laboratory space
  - space for up to 5 cryo-electron microscopes
  - a lecture hall for 170 participants
- 52 million Euro has been provided for the construction of the CSSB building by the Federal Republic of Germany, the Free and Hanseatic City of Hamburg, the Federal State of Lower Saxony and the Federal State of Schleswig-Holstein.

[www.cssb-hamburg.de](http://www.cssb-hamburg.de)

